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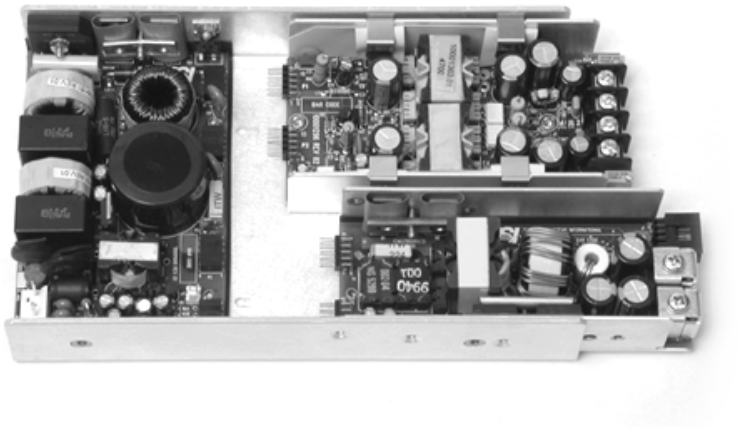
Switching Systems International

Marketing Specification

Synergy LP^2 Series



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Product Marketing Specification
Synergy LP^2 Series

1.0 Introduction

This document defines the product specification for the low power Synergy series of power supplies based upon a flexible, modular architecture known as the LP^2 Modular. This product consists of three Power Platforms and a combination of Output Modules that can be selected from the 33 standard units .

1.1 Front End or Power Platforms

This product line is designed to accommodate power requirements of 150, 250, 350 and 450 watts. Input is single phase AC power in the 90-264 volt range to comply with international safety agency requirements.

1.2 Output Modules

Output modules are available in standard Single (S), Dual (R), Dual slim-line (U) and Triple (T) output combinations.
These output modules range from 90 to 260 watts of total power.

Module Matrix **Table 1**

Module Number	Output Config.	Voltage and Current	Regulation	Topology	Slot Size (inchs)
S1	SINGLE	2.5V@50A	1%	FORWARD	2
S2	SINGLE	3.3V@50A	1%	FORWARD	2
S3	SINGLE	5V@50A	1%	FORWARD	2
S4	SINGLE	12V@20A	1%	FORWARD	2
S5	SINGLE	15V@17A	1%	FORWARD	2
S6	SINGLE	24V@10A	1%	FORWARD	2
S7	SINGLE	28V@9A	1%	FORWARD	2
S8	SINGLE	36V@7A	1%	FORWARD	2
S9	SINGLE	48V@5A	1%	FORWARD	2
S11	SINGLE	1.8V@50A	1%	FORWARD	2
R1	DUAL	12V@6A, 12V@6A	1%	FLYBACK	2.65
R2	DUAL	15V@5A, 15V@5A	1%	FLYBACK	2.65
R4	DUAL	5V@8A, 24V@3A	1%	FLYBACK	2.65
R5	DUAL	12V@6A, 24V@3A	1%	FLYBACK	2.65
R6	DUAL	5V@8A, 12V@6A	1%	FLYBACK	2.65
T1	TRIPLE	5V@20A, 12V@4A, 12V@4A	Main 1%,Aux2%	NOTE 1	2.65
T2	TRIPLE	5V@20A, 15V@ 3A, 15V@3A	Main 1%,Aux2%	NOTE 1	2.65
T3	TRIPLE	3.3V@20A, 12V@4A, 12V@4A	Main 1%,Aux2%	NOTE 1	2.65
T4	TRIPLE	3.3V@20A, 15V@ 3A, 15V@ 3A	Main 1%,Aux2%	NOTE 1	2.65
T6	TRIPLE	12V@10A, 12V@4A, 5V@4A	Main 1%,Aux2%	NOTE 1	2.65
T7	TRIPLE	24V@4A, 15V@3A, 15V@3A	Main 1%,Aux2%	NOTE 1	2.65
T8	TRIPLE	5V@20A, 12V@4A, 5V@4A	Main 1%,Aux2%	NOTE 1	2.65
T9	TRIPLE	24V@4A, 15V@4A, 5 V@4A	Main 1%,Aux2%	NOTE 1	2.65
T10	TRIPLE	12V@10A, 12V@4A, 15V@3A	Main 1%,Aux2%	NOTE 1	2.65
T11	TRIPLE	24V@4A, 5V@4A, 5V@4A	Main 1%,Aux2%	NOTE 1	2.65

Note 1 - Main Output = Forward converter
Auxiliary = Buck regulators.
Requires minimum load on main output.

Dual – Slim Line Output Modules
The following is a list of Dual Slim Line output modules designed to fit into a 2" slot and provide up to 5 output connections when used with a Triple output module.

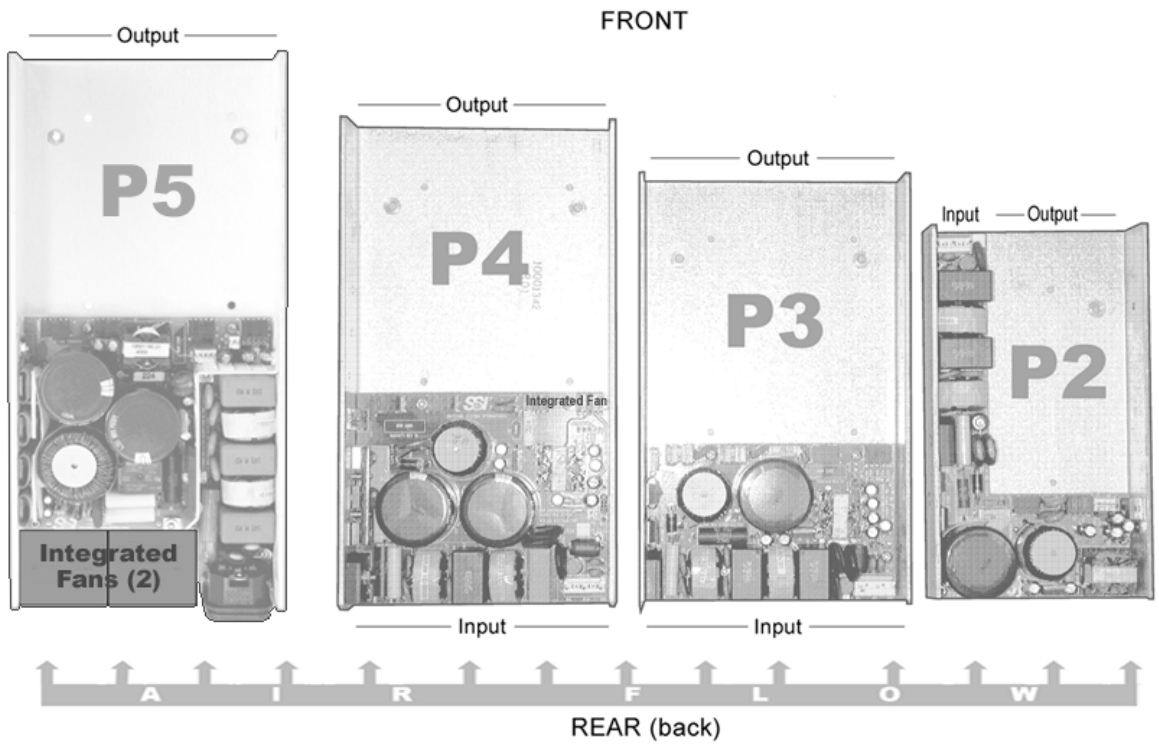
Module Number	Output Config.	Voltage and Current	Regulation	Topology	Slot Size (inchs)
U1	DUAL	5V@40A, 5V@4A	Main 1%,Aux2%	Note 3	2
U2	DUAL	5V@40A, 12V@4A	Main 1%,Aux2%	Note 3	2
U3	DUAL	5V@40A, 15V@4A	Main 1%,Aux2%	Note 3	2
U4	DUAL	5V@40A, 24V@2.5A	Main 1%,Aux2%	Note 3	2
U5	DUAL	3.3V@40A, 5V@4A	Main 1%,Aux2%	Note 3	2
U6	DUAL	3.3V@40A, 12V@4A	Main 1%,Aux2%	Note 3	2
U7	DUAL	3.3V@40A, 15V@4A	Main 1%,Aux2%	Note 3	2
U8	DUAL	3.3V@40A, 24V@2.5A	Main 1%,Aux2%	Note 3	2

Note 3 - Main Output = Forward converter
Auxiliary = Buck regulators
Requires minimum load on main output.

1.3 Cooling Requirements

All LP^2 power supplies require a minimum of 350 lfm airflow across the length of the power supply to maintain full output capabilities. Airflow / temperature de-rating curves are available in Applications Note #1.
Note: the P5 power platform is supplied *complete with* dual fans and cover to ensure correct cooling.

Airflow and Cooling **Figure 1**



1.4 Options

1.4.1 Fan and Cover Options

Standby 5-volt output and the fan power connectors are standard.

Two versions of cover & fan assembly are provided.

Figure 2 Cover with Top mounted fan

Figure 3 Cover with End mounted fans

Figure 2 and 3 illustrate the two fan options for the LP² Modular power supplies. Both options provide adequate airflow to run at full rated power with ambient temperature in the 0-50°C range (the P5 model is shipped with an end fan cover as standard).

The Top fan option fits in a height of 2.5" with no increase to length or width to power platform
The End fan option fits in a 1U rack space (1.75"). The P2 package with end fan is 1.7"x 4"x 8.63
The P4 and P5 packages with end fan covers are 1.7" x 5" x 10.69" (*including* 1/8" IEC connector flange)

1.4.2 Medical Low Leakage standard

Medical low leakage models including UL2601-1 and IEC60601-1 approval is contained in a separate medical product specification Synergy LP-MD Modular.

2.0 Product Family

This product line will consist of the following platform configurations:

Power Platform Configurations **Table 2**

Output Power	Input V AC	Chassis Type	Outputs	I/O Configuration
150 watts	90-264V AC	A	1 to 3	R/F, I- Molex O- Terminals/Molex
250 watts	90-264V AC	B	1 to 5	R/F, I – Molex O – Terminals/Molex
350 watts	90-264V AC	C	1 to 5	R/F, I – Terminals O – Terminals/Molex
450 watts	90-264V AC	D	1 to 5	R/F, I – Terminals O – IEC 320 connector

2.1 Chassis Type

There are four types of chassis in this series. These power platforms are created to accept all relevant power level output modules and options. The chassis is designed for flexibility to ensure that the product can be optimized for specific customer applications.

Power Platform (chassis) Codes **Table 3**

Power Platform	Chassis Code	Size	Power Density (watts / cubic inch)
P2	A	1.5 x 4 x 7 inches (150W)	3.6
P3	B	1.5 x 5 x 8 inches (250W)	4.2
P4	C	1.5 x 5 x 9 inches (350W)	5.2
P5	D	1.7 x 5 x 10.7 inches (450W)	5.2

2.1.1 Chassis Construction
The chassis is constructed out of aluminum with suitable thickness and material properties for the intended application, taking into account rigidity, weight and heat dissipation requirements.

2.1.2 Chassis Finish
All Aluminum parts are finished with a clear chemical film. Copper parts are electro tin-plated.

2.2 I/O Configurations

2.2.1 Input
The Input Molex connector, requires Molex 09-50-3051 mating connector with Molex pins 08-52-0072 (18-24 AWG wire).

2.2.2 Output
High current outputs via M4 screw terminals.

Low current outputs via M3.5 terminal block screws.

Aux outputs via multi pin Molex connector. Requires Molex mating connector 39-01-2060 with Molex pins 39-00-0056 (18-24 AWG wire).

I/O Configuration Types by Chassis **Table 4**

Chassis	Input	Output	Figure	Airflow (customer)
P2 (150)	Front	Front	4 & 8	Rear to Front, see Figure 1
P3 (250)	Rear	Front	5 & 9	Rear to Front, see Figure 1
P4 (350)	Rear	Front	6 & 10	Rear to Front, see Figure 1
P5 (450)	Rear	Front	7 & 11	Rear to Front, Fan cover incl.

Note: The above table denotes standard configurations. Customer specific I/O configurations & termination types will be addressed on a 'custom' basis as required to meet specific customer requirements.

Input / Output connector location (refer to Figures 7-9 for *additional* detail)

Figure 4 P2 Power Platform

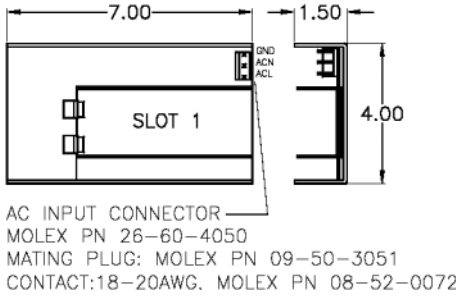


Figure 5 P3 Power Platform

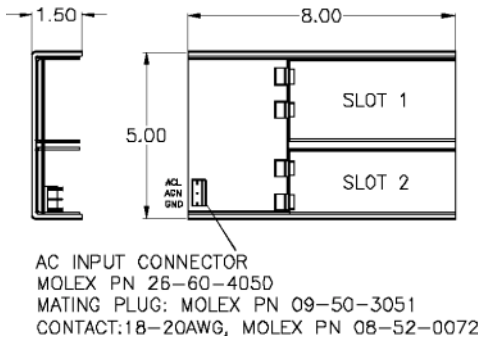


Figure 6 P4 Power Platform

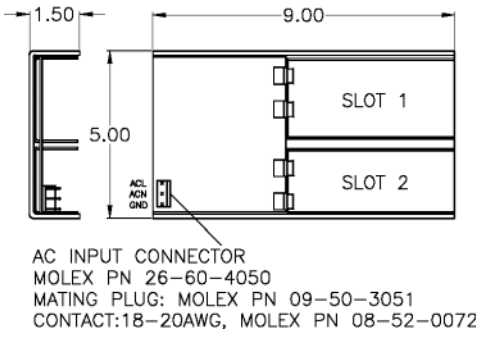
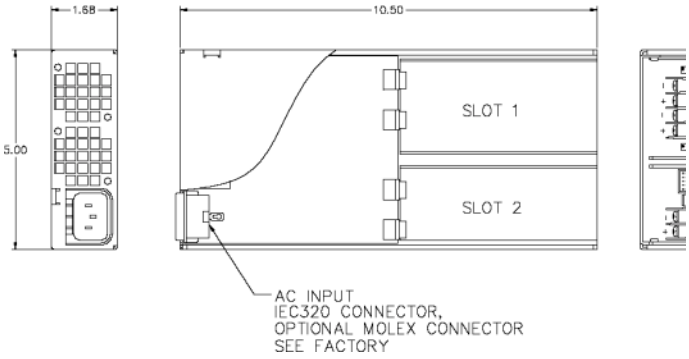


Figure 7 P5 Power Platform



3.0 Target Markets

The LP series of power supplies has been optimized for single and multiple output configurations of standard voltage / current combinations in low to medium volume OEM requirements. Standard configurations are targeted at applications requiring 1-5,000 units per annum. Customized platforms have the ability to be competitive, with currently anticipated production methods and resources, up to 10,000 per annum.

The LP series of power supplies will replace the low-power SQM / SQV lines of SSI's current product offering.

New markets will find the extended power range, feature sets, 1U packaging and ease of modular configuration of the LP series most attractive.

3.1 Industries served

This product family has been designed with such flexibility as to be appropriate for most domestic and international commercial electronic markets. Specific industries for which the LP series has been designed include: communications, network, telecom, datacom, system integration, computer peripherals, instrumentation, process control, medical test and industrial automation.

3.2 Market Specific Options, overview

Certain parameters are typically required within specific markets and industries. To enable the LP series to address the widest possible range of markets, provisions have been incorporated within the product design to ensure market compliance and acceptance.

3.2.1 Market Options

The following is a list of some options that may be addressed to meet specific market requirements.

Medical	(*Separate LP product line*)
Industrial	Transient & Surge protection (STANDARD)
Communications	N+1 value-added chassis (VALUE-ADDED)
Process Control	Extended hold-up, Transient & Surge protection
Computer	Level "B" EMI, 5V Standby

Note: Other customer specific options will be addressed on a custom basis as required.

4.0 Product Specifications

4.1 Specification Parameters

Parameters under the control of this specification include those items that govern the operational performance, fit, functionality, reliability and integration within the end customer application. Certain additional requirements may be presented outside the scope of this defined specification and these will be considered on a modified-standard or custom basis, where appropriate.

4.2 Product Specification **Table 5**

AC Input	90-264V AC, 47-63 Hz single phase
Inrush Current	Less than 20A peak
Efficiency	75% typical at nominal line. 24V+ single outputs 80%
EMI	Radiated and Conducted per CISPR 11 level B, CE compliant.
PFC and Harmonic Correction	All AC input models compliant with IEC1000-3-2, or current spec
Input Transient and ESD, AC	All modules compliant with IEC6100-2,3,4,5,6 (Level 3 minimum) And IEC year 2001 compliance specifications
Line Regulation AC input	Less than 0.1% for line variations from 90-264V AC Less than 0.3% for dual and triple output modules
Load Regulation	Less than 1.0% no load to full load and full load to no load, mains. Less than 2.0% for dual and triple output modules
Cross Regulation	Less than 0.1% between single output modules. Less than 2% between dual outputs with 25% step load change on main output.
Current share	Single wire on all main outputs, droop on secondary outputs
Temperature Coefficient	0.02 – 0.03%/degree Celsius
Output Adjustment Range	± 10% of nominal on all Main outputs 5 -15 volts on U and T module Auxiliary outputs
Thermal Protection	Power supply is self-protecting in the event of an over temperature condition. Normal operation may be restored once the unit has cooled down. AC must be recycled.
Over Current Protection, Input	All input converters are fuse protected (by suitable agency rated fuse)
Over Current Protection, Output	Output Module current limits are configured for N+1 redundant operation and Hot-Swap designs. They are fold-back, self recovering and limited to a maximum of 140% nominal rating.
Over Voltage Protection	OVP is standard on all Main Output Modules and low voltage secondary outputs. 120-130% of nominal.
Minimum Load	No preload is required on any Single (S) or Dual (R) output module. A 10% preload is required on main output of Triple (T) and Slim-Line Dual (U) outputs.
Dynamic Response	±25% load change from a steady state 75% of nominal at a rate of 1A/µsec will result in an output deviation no greater than 2% or 100mV peak. 125mV for outputs 4V or less. Outputs are to recover to within 1% of nominal voltage within 350µsec.
Holdup Time, AC Input	All AC Input units will maintain regulation within specifications for a period of not less than 16msec for 60Hz, (20msec for 50Hz) at full rated load from nominal 115/230 line voltage.
Remote Sense	All main outputs incorporate remote sense and are able to compensate for a total cable drop up to 0.5V DC.

Table 5 (continued)

Isolation Ratings	Consistent with Agency Requirements. 60V+ modules provide a minimum of 500V DC output to ground isolation.
Cooling	Temperature performance curves are available for both convection and forced air cooling applications in Applications Note #1
Operating Temperature Range (Fan Cooled)	0 to +50°C @ 100% rated load in compliance with specification. Refer to de-rating curves for temperatures above 50°C.
(Convection)	Consult SSI Engineering for details or refer to de-rating curves.
Turn-on Voltage	Power supplies will turn on over a range of 0 to +70 degrees C.
Storage Temperature	-40 to +85 degrees C
Operating Altitude	-350 to 7,500 feet with no de-rating
Shock	Commercial transportation ratings, suitable for International Air and Ground transport (see HALT test reports for more information)
Vibration	Commercial transportation ratings, suitable for International Air and Ground transport (see HALT test reports for more information)
Mounting	All platforms – two surfaces, bottom and one side
Physical Size	P2 1.5 x 4 x 7 inches P3 1.5 x 5 x 8 inches P4 1.5 x 5 x 9 inches P5 1.68 x 5 x 10.5 inches
Weight	P2 1.7 Lbs net, 2.5 Lbs Ship P3 2.3 Lbs net, 3.5 Lbs Ship P4 2.9 Lbs net, 4.0 Lbs Ship P5 3.8 Lbs net, 4.9 Lbs Ship

4.2.1 Safety Agency Approvals

Table 6

Safety Agency Approvals	UL 1950, CSA 22.2 No. 950, TUV/EN60950/IEC950, SELV (On modules up to 60VDC at maximum OVP set point). IEC1010/UL3101

4.2.2 Product Warranty

Table 7

Warranty	Switching Systems International's Two-year warranty includes labor as well as parts. Warranty applies to operation within published specifications in a suitable environment within two years from date of shipment.

4.2.3 Signals

Table 8

Signal	**150 Watt**	**250 Watt**	**350 Watt**	**450 Watt**
AC Power Fail	Standard	Standard	Standard	Standard
Enable High / Low	Standard	Standard	Standard	Standard
Output Inhibit, low	Standard, mains	Standard, mains	Standard, mains	Standard, mains
DC Power Good	Standard, mains	Standard, mains	Standard, mains	Standard, mains
Current Share	Main outputs	Main output (s)	Main output (s)	Main output (s)

4.3 Model Numbering System

The Synergy LP² series is a new line of products and part of the Synergy family, in terms of the modular design. To ensure a cohesive numbering policy, the recently established Synergy series numbering convention is applied.

The Power Platforms (front-ends) are numbered as follows:

P2 - 150 watt
P3 - 250 watt
P4 - 350 watt.
P5 - 450 watt

Modular construction combined with SSI's sub-assembly stocking program Is designed to make ordering and receiving standard (and what was once considered to be "Custom") power supplies quick and easy.
Model numbers can be filled in from the model number matrix to enable ordering by telephone or fax. Quantity orders for new power supplies will be shipped in a matter of weeks rather than months.
An Online Configurator will automatically 'assemble' the model number dynamically as the power supply is configured on the SSI Web Site, facilitating quick quotations as well as Online Ordering of small quantities (1-9 units).
Requests for larger quantities will result in an online RFQ.

Model Number breakdown

P _____ - _____ _____ - _____
Watts Slot 1 Slot 2 Options

Table 9

Power, & Input Voltage	Watt Code	Slots	Size
150 Watts, 90-264V AC	2	1	1.5 x 4 x 7 inches
250 Watts, 90-264V AC	3	2	1.5 x 5 x 8 inches
350 Watts, 90-264V AC	4	2	1.5 x 5 x 9 inches
450 Watts, 90-264V AC	5	2	1.68 x 5 x 10.5 inches

Options - **FT** for Top Fan Cover - **FE** for End Fan Cover

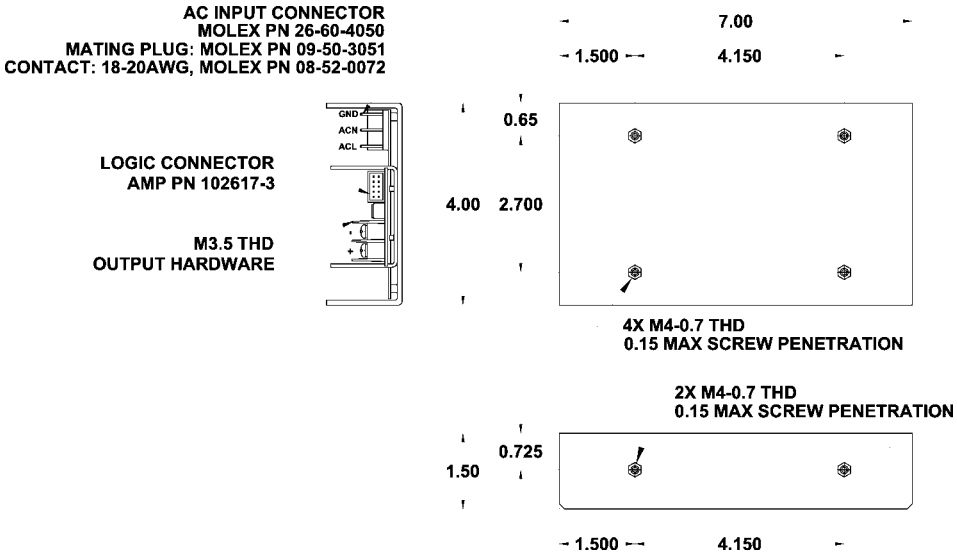
Sample model numbers:

P4-S2R6 rating of **350 watts** with **(S2)** 3.3V/50A, **(R6)** 5V/8A, 12V/6A

P3-S3T7-FT3 rating of **250 watts** with **(S3)** 5V/50A, **(T7)** 24V/4A, 15V/3A, 15V/3A, including the optional Top Fan Cover.

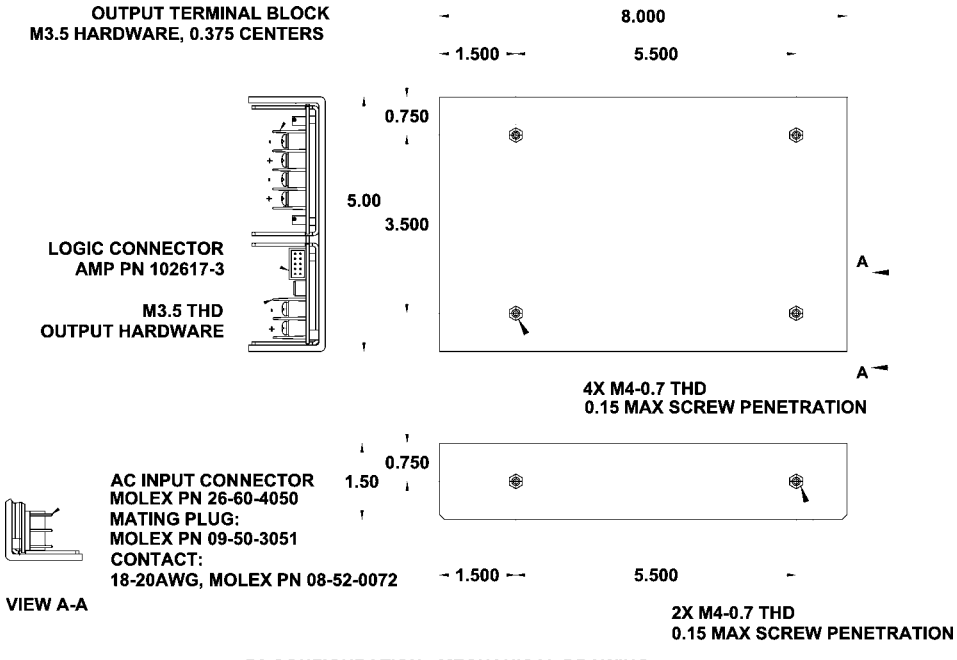
Note: The P5 includes an End fan as standard. Top fan optional.

Figure 8 - P2 I/O and Mounting



P2 CONFIGURATION - MECHANICAL DRAWING
(P2-'S' HIGH VOLTAGE MODULE SHOWN)

Figure 9 - P3 I/O and Mounting



P3 CONFIGURATION - MECHANICAL DRAWING
(P3-'S'-'R' MODULES SHOWN)

Figure 10 - P4 I/O and Mounting

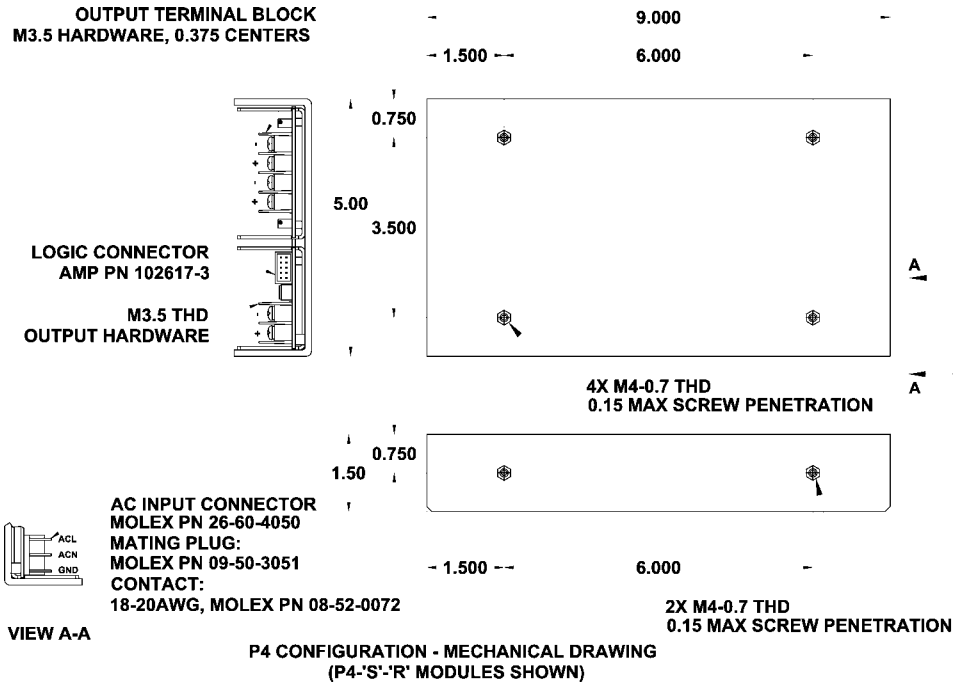


Figure 11 - P5 I/O and Mounting